

SCUTTLE FLIES (DIPTERA: PHORIDAE) AS PARASITES OF EARTHWORMS (OLIGOCHAETA: LUMBRICIDAE)

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Dr Lewis Davies reared *Diplonevra pilosella* Schmitz from a mutilated, but living (at the time of capture), earthworm (Colyer, 1950). He also reared *Triphleba nudipalpis* (Becker) from a dead earthworm (Disney, 1980).

The purpose of the present paper is to report a further case of parasitisation of an earthworm by a scuttle fly.

OBSERVATIONS

On 17 July 1990 a large specimen of *Lumbricus terrestris* L. was observed on a compacted-soil pathway in Horseshoe Wood, Malham Tarn, North Yorkshire (grid ref. 34/882669). Towards its rear end a number of small punctures were evident, due to the swellings around them. Furthermore this worm was being investigated by scuttle flies. Five of the latter were *Diplonevra nitidula* (Meig.), a pair in copula, two females and a male. Slide mounting of the females showed them to have the eggs still immature. The other phorid was a female *Megaselia longicostalis* (Wood), with four mature eggs inside.

The worm was placed in a container with heat-treated soil and thoroughly washed dead leaves. On 20 July four regions at the rear of the worm were demarcated in preparation for autotomy. Three of these regions were autotomized on 21 July. From one of these a phorid larva emerged later the same day. It pupariated, in some damp tissue, on 22 July. During the night of 9/10 August 1990 a male *Diplonevra nitidula* emerged. The worm died on 22 July, probably as a delayed result of getting too hot on a train journey to Cambridge. No further larvae emerged from it or its autotomized sections, or were found in a thorough examination of the remains of these.

DISCUSSION

Diplonevra pilosella and *D. nitidula* were among the most abundant species obtained in emergence traps set over pasture soils in England. *Diplonevra nitidula* represented 21.6% and *D. pilosella* 9.1% of the Phoridae obtained in these traps (Disney *et al.*, 1981). *Triphleba nudipalpis* has been reared from three separate dead white mice, buried for 3 months about 30 cm deep in a heavy clay soil (Disney, unpublished data). The species represented 3.5% of the Phoridae obtained in the emergence traps over pasture soils (Disney *et al.*, 1981). In Germany studies of the soil fauna of reclaimed rubble tips, using emergence traps, yielded no *D. nitidula* or *D. pilosella* in 3-year-old plots. However, in 8-year-old plots *D. nitidula* represented 0.04% and *D. pilosella* represented 4.3% of the Phoridae (Weber & Prescher, 1990). These observations are consistent with the fact that earthworms are known to take several years to invade reclaimed sites (Dunger, 1989). Furthermore Dunger's data show that *Lumbricus terrestris* tends to be one of the last species to become established. Thus the greater prevalence of *D. pilosella* in the trap returns obtained by Weber and Prescher suggests that this species parasitizes worm species other than *L. terrestris*.

Thomson & Davies (1973) reported that with infestations of the earthworm *Eisenia rosea* (Sav.) by larvae of the calliphorid *Pollenia rudis* (F.) 'autotomy of the infected

segments by the worm was observed in some cases where the larva penetrated near the posterior end of the host'. It seems that the same phenomenon occurs with *Lumbricus terrestris* parasitized by *Diplonevra nitidula*.

The fact that the *D. nitidula* adults caught investigating the worm were not gravid is noteworthy. Numerous females of this species have previously been observed swarming all over a dead earthworm (Disney, 1979). However, the literature has too frequently treated reports of Phoridae visiting carrion as evidence for carrion-breeding habits. It is now known that female Phoridae frequently visit carrion to obtain a protein-rich meal. For example *Diplonevra florea* (F.) has been reported feeding from a dead duck and *Megaselia longicostalis* has been reported feeding from dead rabbits (Disney, 1987). Furthermore species of *Phalacrotophora* Enderlein have been recorded feeding on haemolymph exuding from injured larvae and pupae of ladybird beetles (Coccinellidae), their larval hosts (Martelli, 1914; Lichtenstein, 1920; Delucchi, 1953).

The puparium of *Diplonevra nitidula* closely resembles that of *D. pilosella* (see fig. 1 in Colyer, 1950), except that the median pair of processes on the last segment are not obviously shorter than the outer two pairs. Colyer (1950) suggested that Lundbeck's (1922, fig. 57) illustration of a '*D. concinna*' puparium, having subsequently been shown not to be this species, might be *D. nitidula*. This suggestion can now be rejected, as in *D. nitidula* the most dorsal pair of processes on each segment are subequal in length to those in the rows either side (as in *D. pilosella*—fig. 1, in Colyer, 1950). In Lundbeck's figure the most dorsal pair of processes are clearly longer than those in the adjacent rows.

Megaselia longicostalis is frequently caught visiting small vertebrate carrion (Schmitz, 1938, 1943; Disney, 1987) and has been reared by enclosing gravid females with raw meat, on which the eggs were laid and in which the larvae developed (Schmitz, 1938). If it is strictly carrion-breeding in nature then perhaps the gravid female reported above was investigating the possibility of autotomized sections of the worm as an opportunity for oviposition.

It seems clear that *Diplonevra pilosella* and *D. nitidula* will both parasitize earthworms. Whether they exhibit different host preferences remains to be investigated. The fact that the larva of *D. nitidula* emerged from an autotomized section of the earthworm needs to be taken into account in any investigation of infestation rates in the field.

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SHORT COMMUNICATION

Diptera in the Epping Forest area.—These are additional records to "A provisional list of the larger Brachycera, Syrphidae and Conopidae of the Epping Forest area" (*Proc. Trans. Br. Ent. Nat. His. Soc.* 1985; 18: 37-48).

Since publication of my paper in 1985 a number of new species have been added to the area list, one of which is also new to the county of Essex. The list below is a selection of records mainly from parts of the Epping Forest area where I had previously not undertaken any recording. One particularly productive site has been the Cornmill Stream at Waltham Abbey (TL 3801, not originally included in the 1985 paper), part of the Lea Valley Regional Park and a site of special scientific interest. This is an area of long established grazed meadows, still with cattle, adjacent to the Cornmill Stream which was cut to provide water to power a mill (now gone) at Waltham Abbey. The stream has a rich, marginal vegetation which cattle are able to graze; the cattle also 'poach' the banks of the stream in places which may make it attractive to some flies, particularly stratiomyids and tabanids. The Cornmill Stream is some 2 miles north-west of the main body of Epping Forest *sensu stricto*.

I have recorded three species new to the Epping Forest (*sensu stricto*) list: *Epistrophe diaphana* (also new to Essex), I found a male of this species apparently in its typical habitat—old meadow grassland near ancient woodland; *Lejogaster splendida*, an uncommon fly with mainly a coastal distribution in Britain, I found near Fairmead Pond